Suggested Assessment Types for Science and Technology

The following are examples of assessment types that were developed to reflect the depth and breadth of Maine *Learning Results* in science. Table 1 provides a general description of each assessment type, and MAP or LAD assessment examples that meet the item specifications for that type. The sample assessment types should not be interpreted as requirements, but they represent the variety of strategies available to capture the depth and breadth of MLRs considering Form and Function. Tables 2 – 8 are item specifications for each of the assessment types listed, and provide guidance for developing assessments locally. The packet contains examples of each assessment type after the item specifications and concludes with an inventory of assessments available through the Maine Assessment Portfolio (MAP) and Local Assessment Development (LAD) is included. **The MAP or LAD assessments used as examples in this packet were chosen because they were crisp examples of the assessment type and should not be construed as suggestions for a distribution of assessments for certification at the PK-4 grade span. It should also be noted that additional assessments are currently under development.**

Table 1: Example Science Assessment Types with Example Items

Example Science Assessment Types Based Upon Form and Function Reflected in Maine Learning Results	**Example Grades 3-4 MAP and LAD Assessments**
Bundle - A bundle is a set of questions with any combination of selected responses, short answer responses and/or short constructed response questions. A bundle may assess a single performance indicator that is either broad in nature or has multiple components or a bundle may assess up to two related performance indicators. Bundles should have a minimum of 12 units (decision points for scoring or internal score units) with each selected response item counting as 1 unit, each short answer counting as 2 units, and each short constructed response item counting as 4 units. A minimum of 12 units is required to ensure the bundle contains sufficient evidence to make a decision regarding level (s) of performance on the performance indicator (s). Each indicator is scored on a single rubric.	*LAD Earth and Its Moon*
Structured Response - A structured response assessment is defined by students being provided a set of guiding questions and/or formats in which to respond to a topic or problem. To respond to this assessment type, the student does not have to make decisions about the questions that need addressing, nor the format in which to respond.	*MAP Polar Bears in Phoenix* *LAD Chemical & Physical Change*
Scientific Critique – In a scientific critique assessment the student examines scientific claims made by others. The student evaluates the claim, and makes arguments that support or refute the claim based upon the application of content knowledge OR scientific evidence gathered through research.	*None available at this time*
Research Project – In a research project the student is either provided a topic or selects a topic for study, formulates a question to answer, conducts secondary research (seeks literature written by others), analyzes and synthesizes those findings to address the question posed. The product can be a written report, or other presentation styles like a poster, or Power Point presentation, or a brochure based upon the original topic to be studied.	*MAP Different Strokes for Different Folks*

Scientific Investigation – In a scientific investigation a student conducts a short-term and/or long term (long term required for secondary) investigation on a problem identified by the student or the teacher. The student makes a hypothesis, designs an experiment to test the hypothesis, collects appropriate data and observations, represents the finding, analyzes findings, and draws conclusions about the original question/problem of study. When appropriate, observational data is collected on J.1 – Make accurate observations using appropriate tools and units of measures and/or other skill based indicators.	*MAP Disappearing Lifesaver* *LAD Comparing Soils*
Design Technology - In a design technology assessment students are asked to design a product that will solve a technical problem.	*LAD Strike Up the Band*
Personal Communication – A personal communication requires interaction between the student and a teacher through an observation, interview or conference.	*LAD Seeing Cells (partially)*

Assessment Type Specifications: Tables 2 – 8 provide item specifications for each of the assessment types identified. Specifications for the assessment types are important in order to allow developers, whether state (MMSA is the state contractor for math and science and technology assessments) or local districts, to build comparable assessments for initial use or replacement.

Table 2: Science Bundle Specifications

Bundle Specifications	**Recommended Cluster/Standards/ Performance Indicators Assessed**	**Recommended Structure/Format/Setting**	**Example MAP or LAD Assessments for Grades 3-4**
Description: A bundle is a set of questions with any combination of selected responses, short answer responses and/or short constructed response questions. A bundle may assess a single performance indicator that is either broad in nature or has multiple components or a bundle may assess up to two related performance indicators. Bundles should have a minimum of 12 units (decision points for scoring or internal score units) with each selected response item counting as 1 unit, each short answer counting as 2 units, and each short constructed response item counting as 4 units. A minimum of 12 units is required to ensure the bundle contains sufficient evidence to make a decision regarding level (s) of performance on the performance indicator (s). Each indicator is scored on a single rubric.	Cluster 1, 2, and 3	**Students Interaction:** Student responds to a set of questions individually. **Structure:** A bundle consists of any combination of selected response question, short answer and/or short constructed response questions. **Interaction of process and content**: None since one or two performance indicators in a content standard is assessed. **Recommended Setting:** Student works independently in a classroom setting.	*LAD Earth and its Moon*

Table 3: Science Structured Response Specifications

Structured Response Specifications	Recommended Cluster/Standards/Performance Indicators Assessed	Recommended Structure/Format/Setting	Example MAP or LAD Assessments For Grades 3-4
Description: A structured response assessment is defined by students being provided a set of guiding questions and/or formats in which to respond to a topic or problem. To respond to this assessment type, the student does not have to make decisions about the questions that need addressing to respond to the topic or problem, nor the format in which to respond.	At least one indicator from cluster 1, 2, or 3 AND one or more indicators from cluster 4 consistent with the demands of the assessment.	**Students Interaction**: Students respond to scenario or information provided. **Structure:** May include prompting or key questions. **Interaction of process and content:** Process skills are to be demonstrated in the context of content. It is best to have an item that assesses cluster 1, 2, or 3 AND cluster 4 **Recommended Setting:** Structured response items are treated as a whole. The items usually take more than one class period to complete and may require extended time.	*MAP Polar Bears in Phoenix* *LAD Chemical & Physical Change*

Table 4: Scientific Critique Specifications

Scientific Critique Specifications	Recommended Cluster/Standards/Performance Indicators Assessed	Recommended Structure/Format/Setting	Example MAP or LAD Assessments for Grades 3-4
General Description: In a scientific critique assessment the student examines scientific claims made by others. The student evaluates the claim, and makes arguments that support or refute the claim based upon the application of content knowledge OR scientific evidence gathered through research.	**Primary** – At least one performance indicator from Clusters 1, 2, or 3 and one or more performance indicators of standards K1,2,5; L3; M1 **Elementary** – At least one performance indicator from Clusters 1, 2, or 3 and one or more performance indicators of standards K1,2,4,5,6; L2,3,6 **Middle** – At least one performance indicator from Clusters 1, 2, or 3 and one or more performance indicators of standards K1,2,3,4,5,6,7,8; L1,2,3; M1,3,6 **Secondary** – At least one performance indicator from Clusters 1, 2, or 3 and one or more performance indicators of standards K1,2,4,5,6; L1,2,5,8; M1,3	**Student Interaction:** Student is provided with a claim to critique, or selects a claim. **Structure:** This will depend upon the grade span. Students should be provided with more structure at the younger grades. In middle school and high school students should be asked to support or refute the claim based upon scientific evidence gathered through research. The product can be a written essay, an editorial, a poster or brochure. **Interaction of process and content:** This is best accomplished by having a student critique a content area cluster (1,2, or 3) in which instruction is occurring. **Setting**: Students work over a period of time – days – depending upon the nature of the research required.	*None available at this time*

Table 5: Science Research Project Specifications

Research Project Specifications	Recommended Cluster/Standards/Performance Indicators Assessed	Recommended Structure/Format/Setting	Example MAP or LAD Assessments for Grades 3-4
Description: In a research project the student is either provided a topic or selects a topic for study, formulates a question to answer, conducts secondary research (seeks literature written by others), and analyzes and synthesizes those findings to address the question posed.	**Primary** – J2; L3; M1 and at least one content-based performance indicator from cluster 1, 2, or 3 **Elementary** – J5,6; L2,5; M2,3 and at least one content-based performance indicator from cluster 1, 2, or 3 **Middle** – L1,5; M1,2,3,5,7,8 and at least one content-based performance indicator from cluster 1, 2, or 3 **Secondary** – L1,2,7; M1,4,5,6 and at least one content-based performance indicator from cluster 1, 2, or 3	**Student Interaction:** Student selects or is provided with a topic or question to study. **Structure:** • Identification of a research topic • Formulate research questions • Employ effective search strategies • Decide what information to use • Communicate research findings • Acknowledge research sources Products can include written reports, Power Point presentations, brochures, posters, other. **Interaction of process and content:** The content is the research topic and is communicated through the Nature and Implications of Science cluster standards. **Setting:** The assessment occurs in the classroom and beyond the classroom through an independent study or through research time provided by the teacher (especially for younger students). The timeframe varies depending on the depth of the research and grade span where the research is conducted.	*MAP Different Strokes for Different Folks*

Table 6: Science Investigation Specifications

Scientific Investigation Specifications	Recommended Cluster/Standards/Performance Indicators Assessed	Recommended Structure/Format/Setting	Example MAP or LAD Assessments for Grades 3-4
Description: In a scientific investigation a student conducts a short-term and/or long-term (long term required for secondary) investigation on a problem identified by the student or the teacher. The student makes a hypothesis, designs an experiment to test the hypothesis, collects appropriate data and observations, represents the finding, analyzes findings, and draws conclusions about the original question/problem of study. When appropriate, observational data should collected on J.1 – Make accurate observations using appropriate tools and units of measures and/or other skill based indicators.	**Primary** – J2, J3; K3; L4, L5, L6 and at least one content-based performance indicator consistent with form and function. **Elementary** – J2,3; K3,5; L 1,4,5, and at least one content-based performance indicator consistent with form and function **Middle** – J2,3; K, 6,7,8; L 1,2,4, and at least one content-based performance indicator consistent with form and function **Secondary** – J2,3; K3,4,5; L3,4 and at least one content-based performance indicator consistent with form and function AND when appropriate J.1 through observation and/or other skill based indicators.	**Students Interaction:** The problem or topic to be investigated is either student or teacher generated. **Structure:** **Primary** – student follows prescribed procedure, e.g. 'cook book', or is given a problem (E.g., Does It Sink or Float? – not to be confused with grades 5-8 indicator) to investigate. **Elementary** – student conducts or does experiments, designs a fair test within a defined investigation. The design can be student or teacher defined. **Middle** – Student designs and conducts a controlled experiment and gathers systematic observations. The question to be studied is either student or teacher generated. **Secondary** – Student conducts short term and long-term investigations and revises design as necessary. The question to be studied is either student or teacher generated. **Interaction of process and content:** Performance indicators in Cluster 4 serve as the base for content exploration in a scientific investigation. **Setting:** Depending upon the scope of the question being studied, this could be an independent investigation or embedded in the instructional program	*MAP Disappearing Lifesaver* *LAD Comparing Soils*

Table 7: Design Technology Specifications – (Type Under Development)

Design Technology Specifications	Recommended Cluster/Standards/Performance Indicators Assessed	Recommended Structure/Format/Setting	Example MAP or LAD Assessments for Grades 3-4
General Description: In a design technology assessment students are asked to design a product that will solve a technical problem.	Primary – J4 Elementary – J4 Middle – J6 Secondary – J4 Best if the design can employ content-based knowledge from Cluster 1, 2, or 3	**Students Interaction:** Students work individually to design a product to solve a particular problem. In the process, they apply or make connections to science concepts. **Structure:** Following guidelines, students design and construct a product. The amount of guidance, options for materials, timeframe, and setting will depend on the developmental level of the students. **Interaction of process and content:** Performance indicators in Cluster 4 serve as the base for content exploration in a design technology type. **Setting:** Depending upon the scope of the design project, this could be an independent project or embedded in the instructional program	*LAD Strike Up the Band*

Table 8: Personal Communication Specifications – (Type Under Development)

Personal Communication Specifications	Recommended Cluster/Standards/ Performance Indicators Assessed	Recommended Structure/Format/Setting	Example MAP or LAD Assessments for Grades 3-4
Description: Personal communication requires interaction between the student and a teacher through an observation, interview, conference or lab practical.	Primary – J1, C3, E1, F3 Elementary – J1, C3 Middle – J1, C2, E1 Secondary – J1, F5	**Students Interaction:** Student responds to a prompt or follows a procedure while being observed OR responds to questions or has a conversation with the teacher **Structure:** Specific activity or questions designed to elicit the knowledge and skills in the targeted performance indicators are provided to the student and the assessing adult records observations and/or responses. **Interaction of process and content:** This is largely an assessment of a process but in context of content. **Setting:** Typically completed in the classroom, possible during a science investigation or other lesson (observation) or through a scheduled interview or conference. Interviews or conferences can be scheduled for out-of-class time if feasible and desired.	*LAD Seeing Cells*